Food and Agriculture Organization of the United Nations

Sustainable Forest Management Impact Program on
DRYLAND SUSTAINABLE LANDSCAPES
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Transforming Namibia's drylands: charcoal production as a solution to bush encroachment

COUNTRY CONTEXT

Namibia's drylands face two compounding challenges: increasing pressure on land due to climate variability and the aggressive spread of native encroaching bush, such as Vachellia nilotica, *Terminalia Prunoides and Dichrostachys* cineria (Stafford *et al.*, 2017). These species have spread aggressively over the last decades, reducing the productivity of rangelands, threatening livestock-based livelihoods, and reducing biodiversity and groundwater availability (Shikangalah and Mapani, 2020). The phenomenon of bush encroachment has intensified across Namibia's arid and semi-arid zones, which make up around 70 percent of the country's land surface (National Drought Task Force, 1997). Nearly one-third of the land (approximately 45 million hectares) is affected (Uchezuba et al., 2019). Within the project landscape of Etosha, this is particularly evident in the Oshivelo (Mangetti farms), where bush thickening has become severe and biodiversity levels are critically low. This degradation is not unique to Namibia; bush encroachment is impacting countries across southern and eastern Africa, (including Botswana, Kenya, Ethiopia, South Africa, Uganda, and Zimbabwe), and has altered ecosystem functions globally, with serious implications for food security, economic stability, and rural livelihoods (IUCN, 2021; Shikangalah and Mapani, 2020). It is currently recognized as one of the most extensive drivers of land deterioration in Namibia and is included as the fourth official land degradation indicator in Namibia's Land Degradation Neutrality Target Setting.

While bush encroachment has caused significant economic, ecological, and social impacts, it can be converted into a useful resource if managed strategically. The controlled and responsible harvesting and transformation of invasive bush into certified charcoal and other wood-based products can contribute to efforts to restore degraded rangelands, reduce pressure on forests, and open new income streams. However, efforts to develop these promising value chains should guarantee they are developed in a climate-smart, socially inclusive, and environmentally responsible manner, to ensure their benefits.

Namibia's growing charcoal sector already employs thousands of workers, many of whom are youth and rural laborers. However, the sector remains largely informal and under-optimized, with limited value addition, weak enforcement of environmental standards, and few mechanisms for smallholder inclusion (Shikangalah and Mapani, 2020).

Strengthening and upscaling sustainable charcoal: The DSL-IP in Namibia

Against this backdrop, the Namibian country project of the GEF-7 Dryland Sustainable Landscapes Impact Programme (DSL-IP) is working with the Ministry of Environment, Forestry, and Tourism (MEFT) to unlock the potential of bush-to-charcoal value chains while restoring ecological function and strengthening community resilience. The project aims to catalyze a shift towards integrated dryland management in the Kunene-Cuvelai, Etosha,

KEY FACTS

Sustainable Landscapes Production Framework (SLPF)

A framework to harness positive agriculture-forestry-energy linkages by providing capacity development and income generating opportunities.

Geographic scope

Kunene-Cuvelai, Etosha, and Okavango landscapes, Namibia

Source: United Nations Geospatial. 2011. Map of Namibia. In: United Nations. New York, USA, UN. [Cited 4 July 2024]. https:// www.un.org/geospatial/content/namibia

Note: Refer to the disclaimer on the last page for the names and boundaries used in this map.

Target group

Forest and Farm Producer Organizations (FFPOs) and Community members.

Gender

Based on the assessments undertaken in the landscape, 40 percent of households are female and 9 percent are dual-led. The approach focuses on gender- inclusive interventions to empower women and ensure equitable participation in value chains.

Type of shock/crisis

85 percent of households were affected by climate shocks in the last 3 years, most frequent being drought (78.4 percent) followed by extreme heat (17 percent)

SHOUT
SHARE
IT

Targeted interventions start with understanding the landscape - ILAM ensures decisions are backed by evidence.

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and Okavango sub-basin landscapes, situated in the Kunene, Omusati, Oshana, Oshikoto, and Kavango-East regions, respectively. In the Etosha sub-basin landscape, the focus is on sustainable charcoal production from encroaching native bush species. This approach tackles the root causes of land degradation while supporting value addition and green enterprise development in one of Namibia's most bush-encroached areas. Sustainable charcoal production is promoted not as a stand-alone activity, but as an entry point to integrated landscape restoration. By coupling bush harvesting with targeted regeneration efforts and improved rangeland practices, the project contributes directly to Land Degradation Neutrality (LDN) while helping establish inclusive, climate-resilient rural economies.

The project works through Namibia's established charcoal producer networks and community-based organizations to ensure that benefits reach smallholder farmers and forest users, with a strong emphasis on inclusivity. Household survey findings of the Namibian Child project reveal that women are not marginal actors but actively participate in decision-making and agricultural activities. Many farming and resource management tasks, such as crop cultivation, land management, and water management, are carried out jointly, while certain activities, such as the collection of non-timber forest products, remain more strongly associated with women.

The project aims to support charcoal producers at communal level by promoting collective certification, providing extension services and training, and improving access to financial and technical resources. Through these efforts, the project recognizes the contributions of producers and positions sustainable charcoal production as a driver of equitable and inclusive community development. In addition, through South-South Cooperation, the DSL-IP promotes the exchange of effective sustainable land and forest management practices between countries, bridging insights from Namibia's efforts to scale up sustainable charcoal production to other countries in the region and beyond.

EVIDENCE-BASED, TARGETED AND TAILORED INTERVENTIONS

To align project interventions with realities on the ground and ensure informed decision-making, the DSL-IP is implementing an Integrated Landscape Assessment Methodology (ILAM), a multi-level approach combining geospatial, focused-group discussions, field assessments, and household-level data. At the local level, information has been captured through a tailored survey [1] conducted with targeted Forest and Farm Producer Organizations (FFPOs), and later complemented by a capacity needs assessment of the groups and community members. Findings from the Etosha sub-basin landscape, where the project intends to promote bush-based sustainable charcoal production, illustrate both existing potential and barriers.

POTENTIALS:
Mangetti as a Viable Zone for Bush-Based Charcoal

While most surveyed FFPOs and farmers highlighted that bush thickening causes impediments and challenges to livestock rearing, most farmers do not practice bush thinning. Lack of technical knowledge about sustainable charcoal production methods, lack of access to markets, high upfront investment, absence of suitable trees or bushes, national and local regulations, along with the need for special government authorization, deter producers from adopting the practice.
On the other hand, the forest resource assessment conducted by the DSL-IP indicated that, among the areas assessed, the Mangetti East farms stand out as the only location within the Etosha landscape where sustainable charcoal production from bush encroachment is considered technically and economically viable and practiced mainly by farmers from the Mangetti East farms. Here,

[1] SHARP+ Resilience and Behaviour Change Assessment in Namibia in the regions of Kunene-Cuvelai, Etosha and Kavango sub-basin Landscapes. Available here.

bush thickening is primarily driven by *Terminalia sericea, Croton gratissimus, and Grewia bicolor*, all of which produce dense, high-quality charcoal and are classified as multipurpose species. The estimated annual harvesting potential in this area is approximately 762.7 Basic Equivalent per hectare. Beyond charcoal, the feasible use of the biomass would be firewood, biochar, woodchips, fodder, and basic construction materials, while pods serve as animal fodder and the flowers support local beekeeping potential.

BARRIERS:

Structural, Ecological, and Cultural Constraints in the Etosha Landscape

Although Mangetti East farmers operate on land that has recognized or registered title deeds, these fall into the greater part of communal land area in the Oshikoto region, meaning that current regulations prohibit commercial exploitation of forest resources, including charcoal production. Additionally, Mangetti Farmers Association, as an FFPO, cannot market their products south of the veterinary cordon fence, due to national phytosanitary and animal health regulations. Addressing these regulatory limitations is hence key to facilitating sustainable charcoal production in the area.

Outside of King Nehale Conservancy, particularly in areas such as Omuthiya, the viability of bush-based charcoal production declines significantly. Although bush encroachment is increasingly recognized as a challenge, several interrelated factors constrain the potential for sustainable charcoal enterprises in these zones. An assessment (MEFT, 2023) shows that the dominant woody species are *Vachellia nilotica* (55.3 percent) and *Dichrostachys cinerea* (32.1 percent). While *Dichrostachys cinerea* (sickle bush) is technically suitable for sustainable charcoal production, its uneven distribution and low biomass density limit its capacity to support consistent, livelihood-generating activities. In addition to being vital for local construction and fencing, increased charcoal harvesting could harm existing resources, causing ecological harm, land degradation, and biodiversity loss. These factors indicate that bush-based charcoal production outside King Nehale is not a viable option for sustainable development.

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STRENGTHENING AND UPSCALING SUSTAINABLE CHARCOAL PRODUCTION FROM INVASIVE BUSH

The information and evidence gathered from project landscapes is used by the country project, in close collaboration with the Global Coordination Project, as input in the DSL-IP **Sustainable Landscape Production Framework (SLPF)**, an innovative approach to achieving LDN at the landscape level composed of three key priority areas of intervention:

- **Crop diversification through Community Seed Banks**
- **Peer-farmer learning through Farmer Field Schools**
- **Green value chain development through Forest and Farm Facility**

The framework is implemented with direct support from FAO's mobilized knowledge hubs under its Community of Practices, and executed with support from national and regional partners, ensuring technical recommendations, best practices, and lessons from previous projects are delivered to government officers, technical experts, service providers, landscape actors, and farmers in the landscape. They enable the scaling out of sustainable land and forest management practices, including improved production and conservation (through the Farmer Field Schools and Community Seed Banks), business incubation, value addition, and market access (through the Forest and Farm Facility).

By integrating these mechanisms, the programme directly supports the sustainable upscaling of sustainable charcoal production from invasive bush species, promoting sustainable land management, strengthening knowledge of soil restoration, building market linkages, and providing access to seeds for the regeneration of rangelands. This not only helps diversify production systems but also enhances community resilience to climate shocks while restoring degraded landscapes.

Through the DSL-IP Regional Exchange Mechanism (REM), a coordination structure dedicated to the Miombo-Mopane eco-region, the technologies, practices, and learnings from Namibia's implementation of the SLPF are out-scaled to other countries in the region, enhancing the combined knowledge of the program and fostering South-South cooperation and coordination.

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EXPECTED IMPACT OF CHARCOAL PRODUCTION FROM INVASIVE BUSH SPECIES

The promotion of sustainable charcoal production in Northern Namibia was selected as a core theme of the DSL-IP country project based on its potential to address multiple landscape-level priorities through an integrated, evidence-based approach. To assess the relevance and transformative potential of this theme within the broader landscape management strategy, three key impact criteria were applied:

- **Livelihoods and gender:** Can the proposed practices provide inclusive economic opportunities and reduce livelihood vulnerabilities, particularly for rural women and youth?
- **Land Degradation Neutrality (LDN):** Do the proposed practices contribute to restoring land productivity, reduce degradation, and increase ecosystem functionality?
- **Upscaling potential:** Is there scope for expanding or replicating the proposed practices in other landscapes or contexts within Botswana or beyond?

The following section outlines how these value chains and associated practices can contribute to each of these impact areas.

FARMING SYSTEM CHALLENGE	COMMODITY POTENTIAL FOR SYSTEM TRANSFORMATION	HOW THE SLPF SUPPORTS DELIVERY OF BENEFITS
IMPACT AREA: **Livelihood and Gender Equality**		
Limited rural employment opportunities, especially for women, youth, and seasonal workers.	Charcoal production creates rural jobs in areas with few alternatives (Tabe-Ojong, 2023).	Forest and Farm Facility **(FFF)** strengthen producer organizations, enabling collective bargaining, cooperative business development, and access to premium markets through certification. Farmer Field Schools **(FFS)** provide skills training for safe, efficient charcoal production and value addition.
Gender exclusion in formal value chains.	Targeted support can enable greater integration of women into the value chain, such as in bush processing, packaging, and cooperative management (Koech *et al.*, 2021).	**FFF** promotes women producer groups and gender-inclusive value chains. **FFS** offers tailored technical modules for women and youth; both pillars help secure equal access to equipment, training, and contracts.
Informal labor conditions with poor safety and income insecurity.	Formalization and certification improve working conditions, safety, and income security for laborers.	**FFF:** Organize producers for collective marketing and certification as well as community-led monitoring; **FFS:** Build skills in quality control, packaging, and branding; **FFS:** Train members on selective harvesting, soil protection, and restoration practices.
Limited market access for small producers.	Community-based enterprises gain market entry via branding, sustainability compliance, and value addition.	
High livestock feed costs and limited feed quality	Charcoal by-products can reduce anti-nutritional compounds in livestock feed, improving animal health.	**FFS** demonstrates safe and effective use of charcoal by-products in feed; **FFF** fosters partnerships with feed processors and cooperatives for wider adoption.
IMPACT AREA: **Land Degradation Neutrality**		
Bush encroachment reduces rangeland productivity and biodiversity.	Controlled bush thinning improves rangeland productivity, water infiltration, and biodiversity (Stafford et al., 2017; Shikangalah and Mapani, 2020).	**FFS** builds farmer skills in sustainable bush thinning and rangeland restoration; **FFF** supports collaborative bush control enterprises and links them to restoration financing (e.g., FSC); Community Seed Banks provide planting material for fast-regenerating native or multi-purpose species to complement bush clearing.
Overharvesting of native woodlands for fuelwood and charcoal.	Using encroaching bush for charcoal reduces pressure on natural forests (Shikangalah and Mapani, 2020)	
Unsustainable land use and overgrazing degrade ecosystem services.	Integrating bush control with sustainable grazing plans and reseeding of native grasses helps rebuild healthy landscapes.	**FFS** explore and demonstrate integrated bush control – grazing - reseeding models.
Farmers engage in unsustainable practices such as charcoal production from natural forests due to livelihood pressure.	Sustainable charcoal value chains offer an alternative income stream that reduces reliance on unsustainable land practices.	**FFF** promotes sustainable enterprise models; **FFS** trains farmers in efficiency and compliance to maintain certification; together, they offer profitable alternatives to destructive practices.

IMPACT AREA: **Upscaling of Good Pracrices**
Rising global demand for certified, sustainable charcoal.
Namibia is already a recognized charcoal exporter, with established logistics, international market linkages, and experience in navigating trade regulations. This gives the country a head start in setting standards for sustainable production and creating premium market niches for certified products.
Namibia has recognized bush encroachment as a national environmental and economic priority. The government's Bush Control and Biomass Utilization Strategy provides a policy framework that aligns charcoal production with land restoration, making it easier to scale solutions within a supportive regulatory context.
The ecological conditions that drive bush encroachment in Namibia are shared across much of Southern Africa, particularly in Angola, Botswana, Zambia, and parts of South Africa.

Table 1: Pathways to Land Degradation Neutrality: How Sustainable Charcoal Production from Invasive Bush Species Can Restore Dryland Ecosystems
Source: Author's elaboration.

Namibia's approach to sustainable charcoal production offers a scalable solution that is both climate-resilient and socially inclusive. By promoting certified harvest protocols such as FSC standards, strengthening producer cooperatives to access finance and premium markets, and linking bush thinning with integrated landscape management and secure land tenure, the country is setting a new standard for sustainable biomass use. There is also strong potential to diversify bush biomass value chains, combining charcoal production with biochar, livestock feed, or composting, to maximize both ecological and economic benefits. Through the DSL-IP's REM, Namibia is sharing and refining these practices with other countries facing similar dryland challenges. These exchanges are helping co-develop policy tools, technical standards, and business models rooted in local realities but ready for wider regional replication, positioning Namibia to champion this approach not only as a producer but also as a potential driver of knowledge, innovation, and sustainable standards across the region.

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